

Configuration Management

June 20, 2005

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GSFC Software Process Improvement (SPI) Project

Presentation Objectives

- **By the end of this presentation, you will:**
 - **Understand the ISD Configuration Management (CM) process**
 - **Understand key CM terms**
 - **Understand how to apply the ISD CM processes to your project**
 - **Know where to find additional information on ISD and FSW CM processes**

■ Configuration Management Context

- Purpose
- Definitions
- Roles

■ Configuration Management Process

- Planning and Startup Tasks
- Execution Tasks

■ CM Support Information

■ Summary

Configuration Management: Purpose

- The purpose of Software Project Configuration Management (CM) is to establish and maintain the integrity of the products of a software project throughout the software life cycle.
- Software Project CM involves four key activities:
 1. *identification* of work products and baselines that are subject to configuration control
 2. approval/rejection (*control*) of proposed changes to configuration items
 3. status tracking and reporting (*status accounting*) of configuration data and changes
 4. *audits* to ensure that controlled items meet their requirements and are correctly documented
- These key activities are supported by the ISD CM processes.

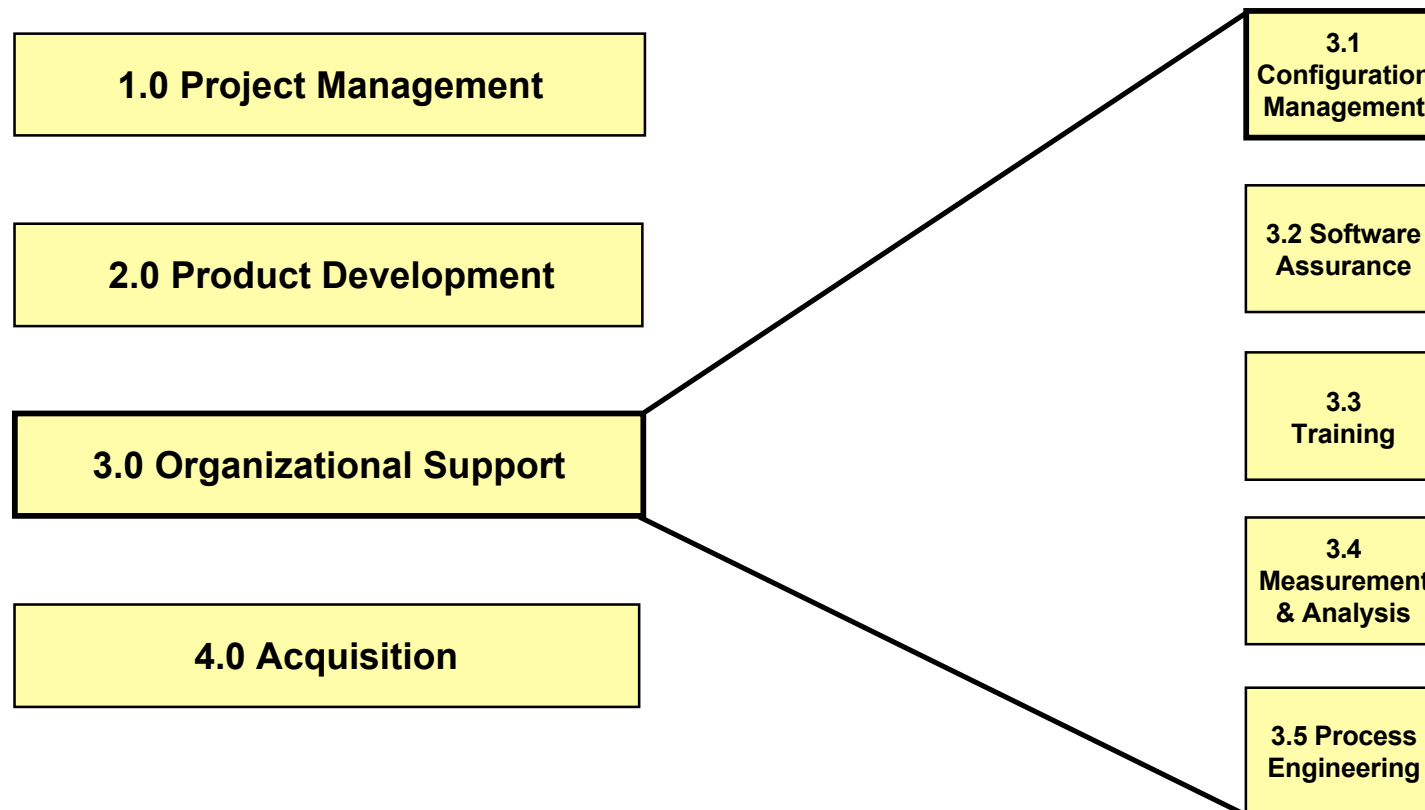
Configuration Management Definitions

- **Project** – Refers to software projects for the development or maintenance of mission support software.
- **Mission Software** – Refers to software directly associated with the operational support of flight projects, including network communications, planning and scheduling, flight system (spacecraft and instrument), flight dynamics, ground mission and science command and control, and science data capture software.
- **CI** – Configuration Item; an aggregation of hardware, software, firmware, or documentation which is designated for configuration control.
- **Baseline** – a set of CIs formally designated and fixed at a specific time during the product lifecycle.
- **DCR** – Discrepancy Change Request; a request to make a change to a CI.

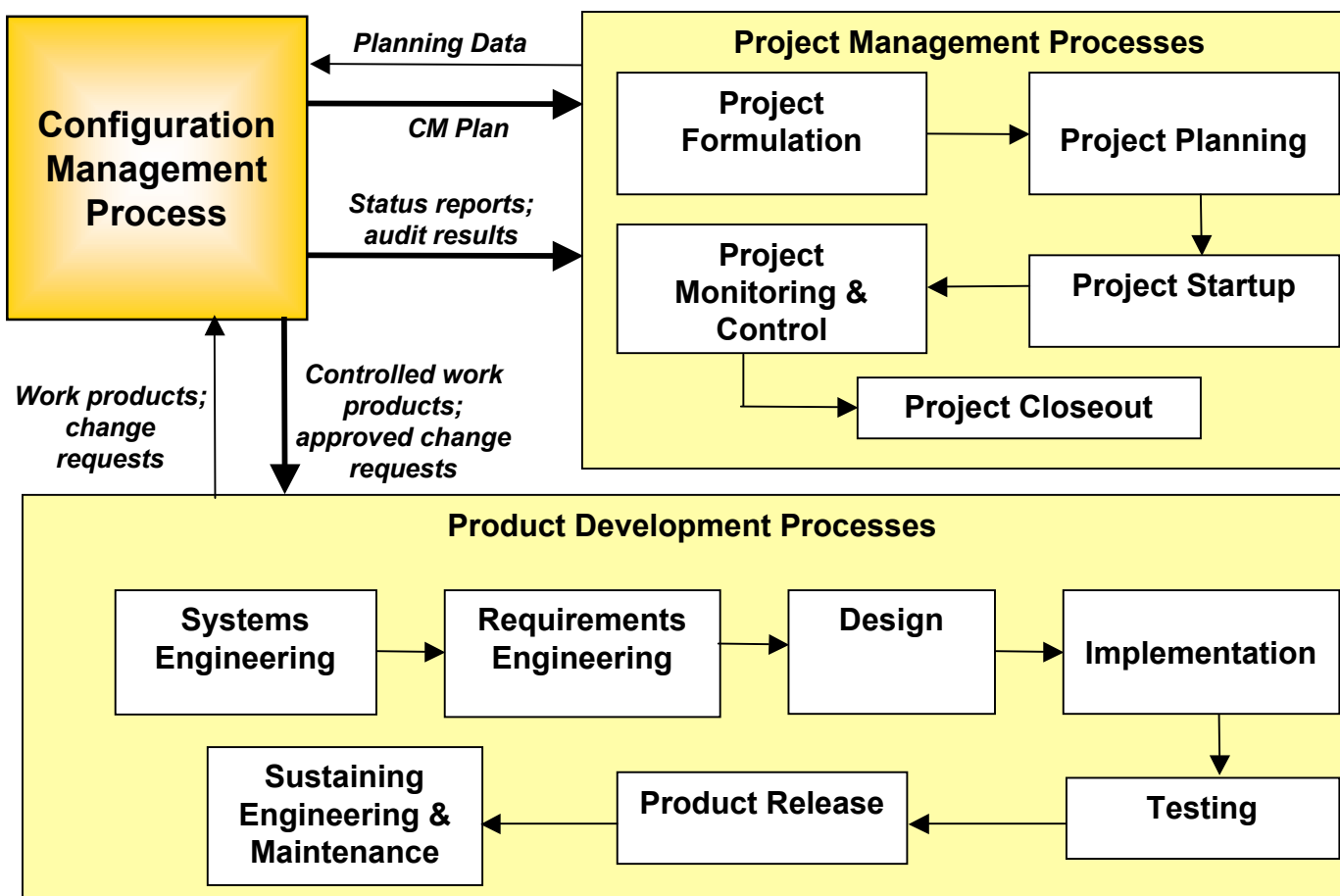
Configuration Management Roles

- **Configuration Management Officer (CMO) –**
Responsible for maintaining the integrity of work products through configuration identification, configuration control, configuration status accounting, and configuration audits.
- **Product Development Lead (PDL) -** Person in charge of software project management activities and of leading the team. This role is specified in Appendix A of the ISD Product Development handbook; it is primarily a project management role.
- **Control Board –** composed of technical and administrative representatives who recommend approval/disapproval of changes to a CI or baseline, e.g., CCB, IRB, etc.

ISD Process Categories

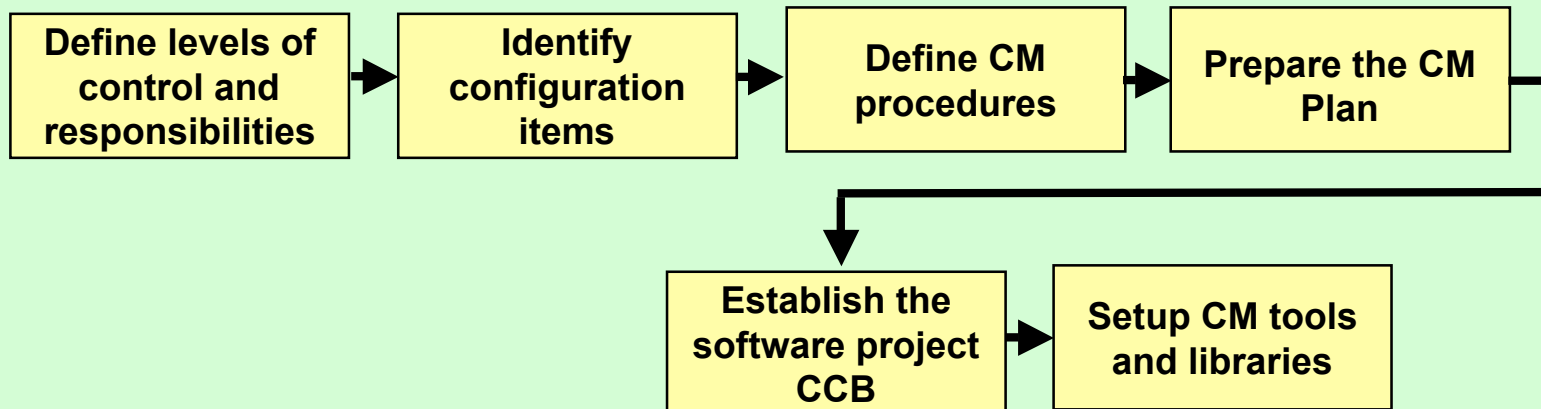


Configuration Management Process

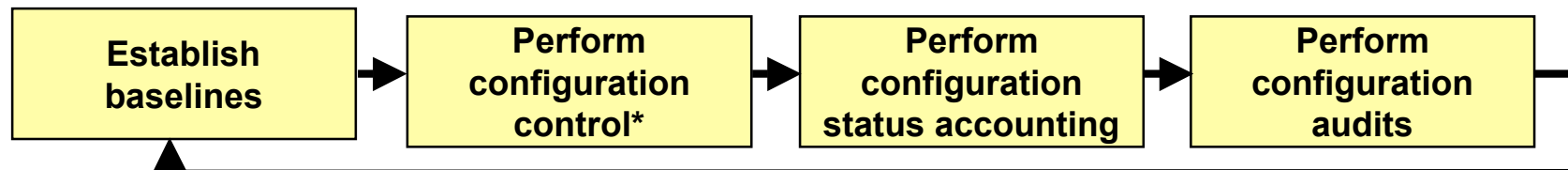


Configuration Management Tasks

CM planning and startup tasks



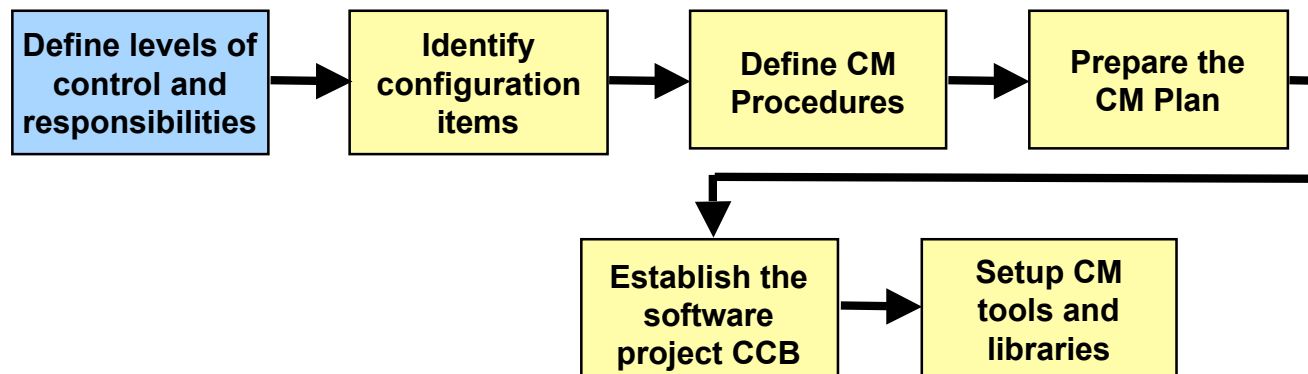
CM execution tasks



CM Planning/Startup Tasks, 1 of 6

■ Define Levels of Control and Responsibilities

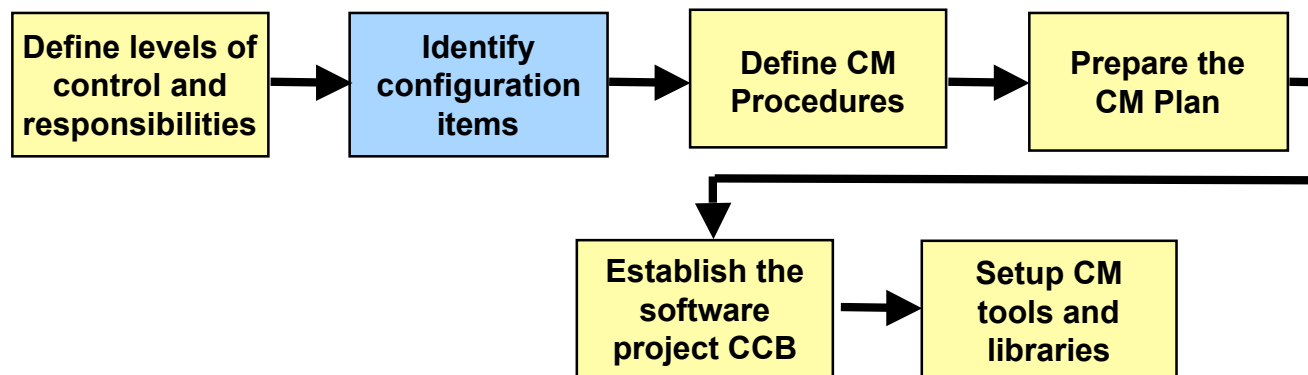
- Define the levels of control that will be used within the CM system
- Specify how the project will record reviews and approvals by authorized personnel
- Identify the persons or groups with authority to approve baselines
- Define the procedures to be followed for baseline management



CM Planning/Startup Tasks, 2 of 6

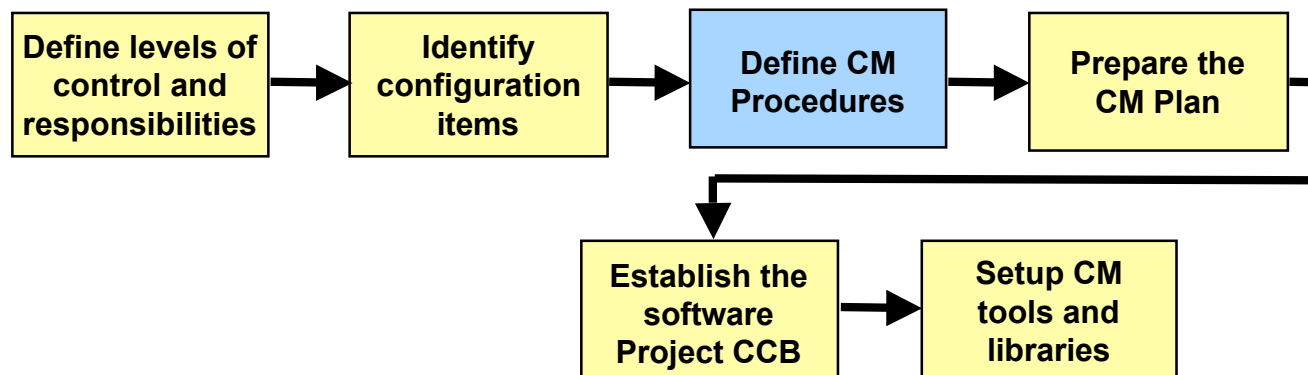
■ Identify Configuration Items

- a) Identify the items to be placed under configuration control.
- b) Identify product baselines for major stages in the project's life cycle.
- c) Identify the products comprising each baseline down to the level of the smallest controllable unit.
- d) Define the naming and labeling conventions that will uniquely identify each configured item.



CM Planning/Startup Tasks, 3 of 6

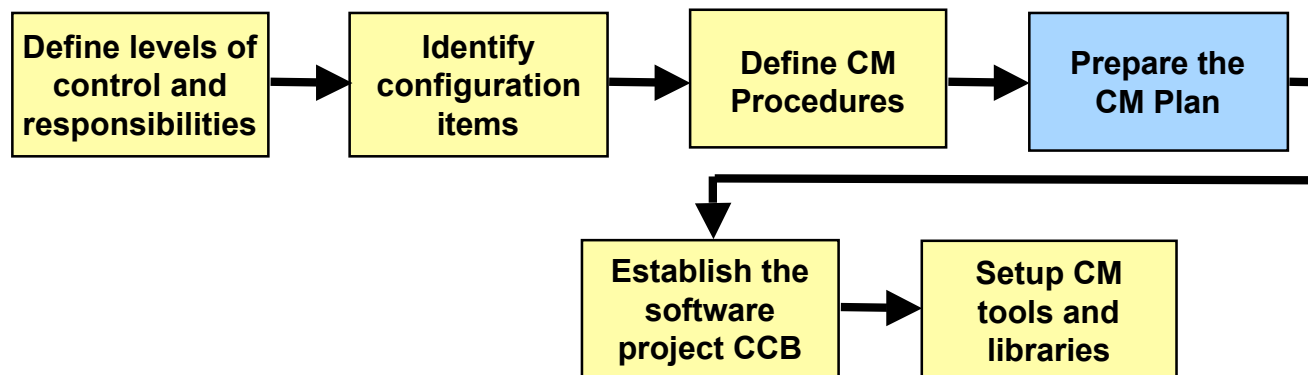
- **Define CM Procedures (that specify how to)**
 - a) Establish, control, update, release, deliver, and maintain configured items
 - b) Backup, archive and restore configuration items
 - c) Perform project builds
 - d) Perform software reuse
 - e) Establish security to prevent unauthorized access to configuration items
 - f) Share configuration items
 - g) Generate CM status reports



CM Planning/Startup Tasks, 4 of 6

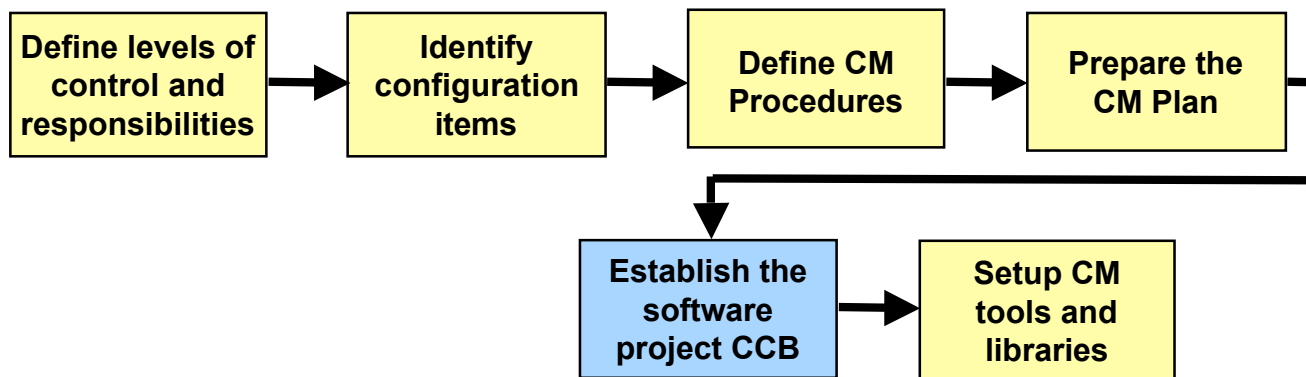
■ Prepare the CM Plan

- a) Identify the software CM organization
- b) Identify the software CM policies and directives
 - tailored from ISD CM Processes or your project templates
- c) Describe the process for configuration identification, control, status accounting, and audits
- d) Describe the release management approach
- e) Provide schedule information of all events affecting the CM Plan's implementation
- f) Describe resource information
- g) Identify the activities and responsibilities for continued CM planning



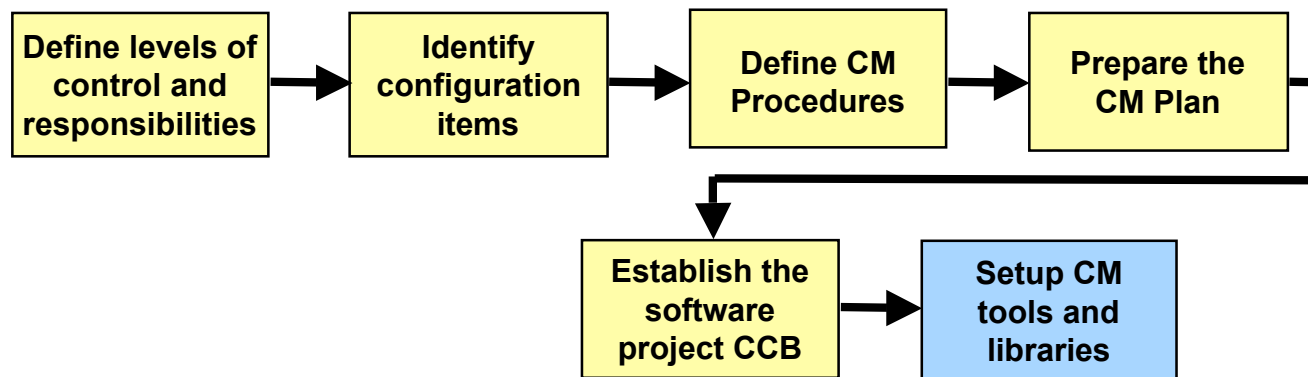
■ Establish the SW project CCB

- Establish and staff a Configuration Control Board (SW CCB) to manage, assess, and control changes to configured items
- Appoint a SW CCB Chair and Secretary
- Establish SW CCB rules and logistics (e.g., meeting location and schedule)



CM Planning/Startup Tasks, 6 of 6

- **Setup CM Tools and Libraries**
 - a) **Identify and install a COTS/GOTS configuration management tool**
 - b) **Identify and install a COTS/GOTS tool to track discrepancy reports**



■ Define levels of control and responsibility

- IRB is controlling authority over the configuration team's FSW products
- IRB chair (PDL) is final decision point of IRB actions with the agreement of the IRB
- CMO
 - Designs, implements and maintains the CM system,
 - Coordinates, supports and performs CM activities, and
 - Uses the CM system to ensure the integrity of all items placed under configuration control.

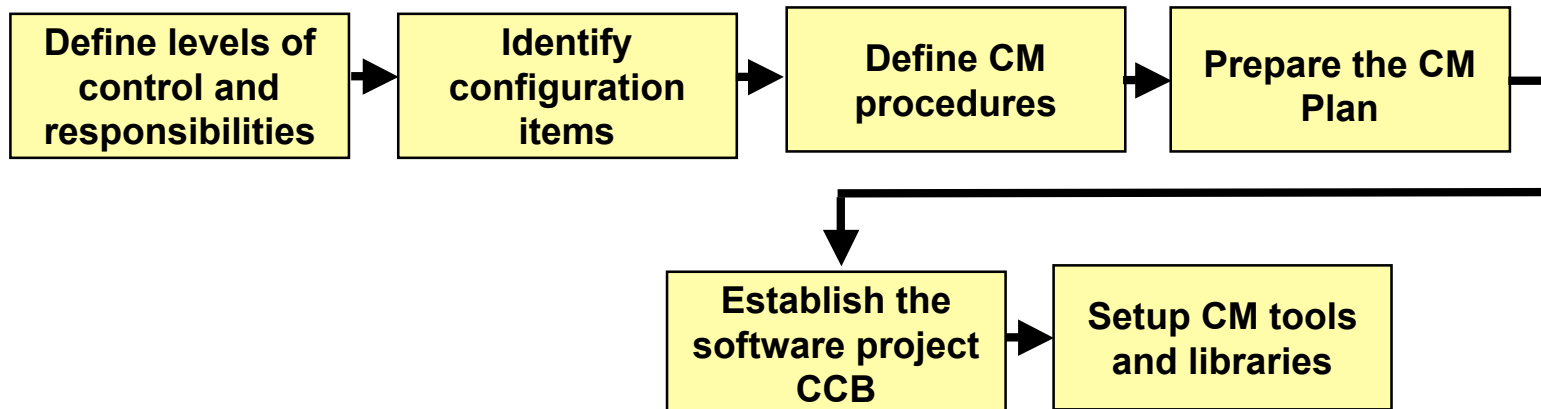
■ Identify configuration items

- ISD process is followed

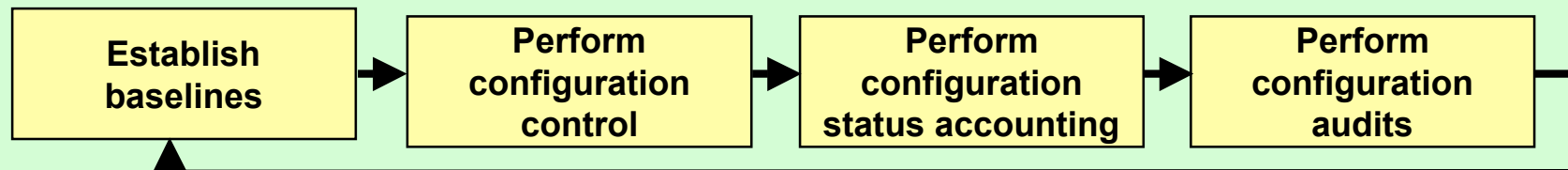
- **Define CM Procedures**
 - Established a FSW CM Procedure template (3.1.1.2.1)
- **Prepare the CM Plan**
 - Established a FSW CM Plan template (3.1.1.1.1)
- **Establish the SW project CCB**
 - Established an IRB which interfaces with the Project CCB as appropriate (handles only FSW DCRs)
- **Setup CM Tools and Libraries**
 - FSW has chosen
 - Clearcase and Source Integrity for CM
 - Clearquest and Integrity Manager for discrepancy tracking

Configuration Management Tasks

CM planning and startup tasks

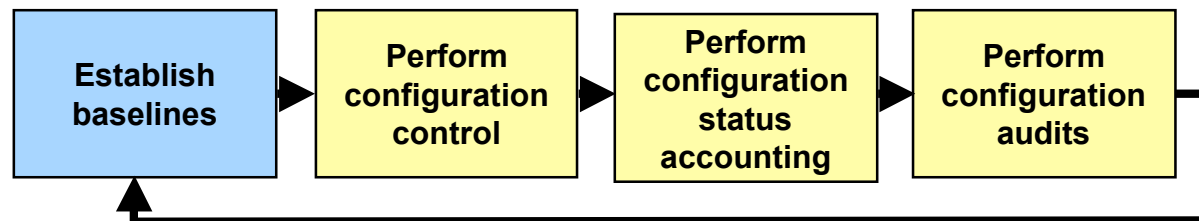


CM execution tasks



CM Execution Tasks, 1 of 4

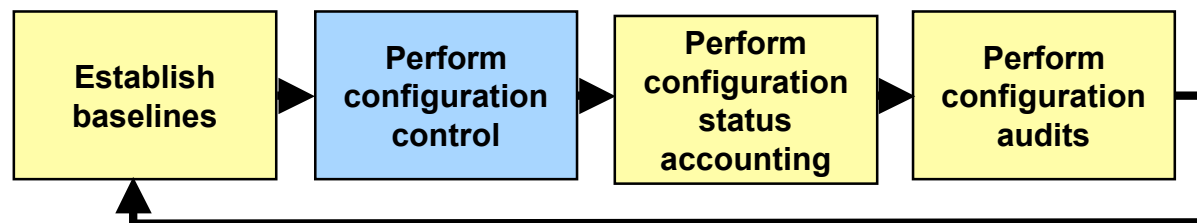
- **Establish baselines**
 - a) **Create a baseline using CIs from the project's CM library**
 - b) **Document the CIs contained in the baseline**
 - c) **Obtain authorization for release of the baseline from the SW CCB**
 - d) **Deliver the baseline and notify stakeholders**
 - e) **Make baselines available**



CM Execution Tasks, 2 of 4

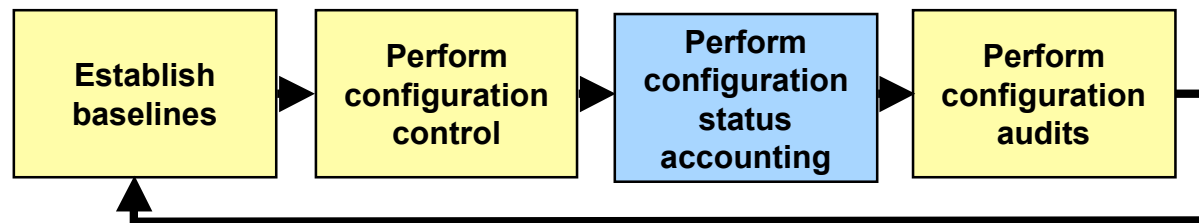
■ Perform Configuration Control

- a) Accept/reject change requests (e.g., DCRs) from members of the software development team, testers, users or customers
- b) Record change requests in the discrepancy reporting database
- c) Review all proposed changes
- d) Disposition each change request
- e) Track the status of change requests and authorize their closure



CM Execution Tasks, 3 of 4

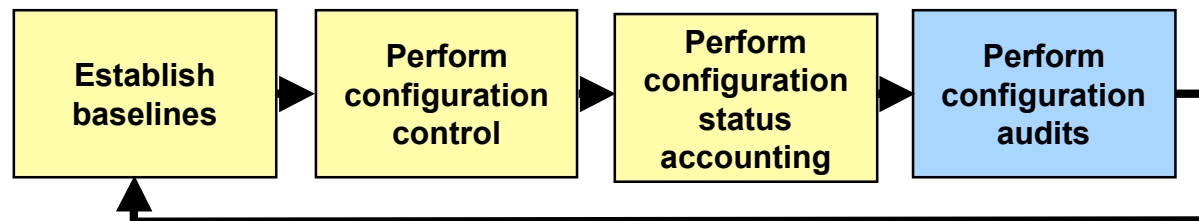
- **Perform Configuration Status Accounting**
 - a) **Maintain records of the CIs throughout the project's life cycle**
 - b) **Record and monitor all changes to CIs**
 - c) **Document the contents of versions, builds, and baselines**
 - d) **Make CM records available to stakeholders**
 - e) **Produce periodic status reports**



CM Execution Tasks, 4 of 4

■ Perform Configuration Audits

- a) Perform ad hoc or in-process audits periodically
- b) Perform a Functional Configuration Audit (FCA) after testing is complete
 - Requirements Traceability Matrix (RTM)
- c) Perform a Physical Configuration Audit (PCA) prior to each release or baseline delivery
 - Version Description Document (VDD)
- d) Perform formal audits (done by either the CMO, SW Assurance engineer or a combination of the two)



- **Establish baselines**
 - **ISD process is followed**

- **Perform Configuration Control**
 - **Established a FSW DCR procedure**
 - **Established a FSW IRB**
 - **Established a FSW action item tracking tool**

FSW Tailored CM Execution Tasks, 2 of 2

■ Perform Configuration Status Accounting

- Established FSW standard reports (document release records, DCR status report, action item report, configuration articles list, etc.)

■ Perform Configuration Audits

- Provided for pre-ship reviews
 - Ensures that only approved changes are applied to the baseline
 - Ensures that all DCRs are incorporated to the baseline
 - Ensures that the contents of the delivery are consistent
 - Ensures that the baseline is protected
 - Ensures that audit results are documented in the VDD and action items are tracked to closure

Keeping CM Records

Products of the CM process that should be kept in the project data stores:

- The CM Plan with responsibilities, procedures, baselines, CIs, naming conventions, and CCB membership defined
- CM library, with history tracking for CI baselines, CI changes
- CCB change request tracking history, with assessment, recommendations, and authorization or rejection records
- CM status accounting data and information
- CM audit data and information
- CM measurement data and information

Configuration Management – Related Assets

- **Policies**
 - ISD Software Policies (1.0.0.1)
- **Processes and Sub-processes**
 - ISD Software Configuration Management (3.1)
 - FSB Standards CCB Process (3.5.3.1.1)
- **Standards, Procedures, Guidelines, Templates, and Checklists**
 - Functional Configuration Audit Checklist (3.1.1.3) – *coming soon*
 - Physical Configuration Audit Checklist (3.1.1.4) – *coming soon*
 - FSW Configuration Management Plan Template (3.1.1.1.1)
 - FSB Configuration Management Procedures Template (3.1.1.2.1)
 - FSW Configuration Management Recommended Practice (3.1.1.2.2) – In progress

Finding CM Process Assets

<http://software.gsfc.nasa.gov/process.cfm>

Select Organizational
Support,

then Configuration
Management

To get all approved Configuration
Management assets

The screenshot shows two browser windows. The left window is the 'GSFC's Process Asset Library' homepage. The right window shows the 'Organizational Support' page with a table of Configuration Management assets.

GSFC's Process Asset Library - Microsoft Internet Explorer

Address: <http://software.gsfc.nasa.gov/process.cfm>

Process Assets Library (PAL)

- + Process Structure
- + PAL Feedback Form
- + PAL Help
- + Glossary

Process Assets Library (PAL) is the repository for software development at GSFC, PAL and procedure descriptions, document templates are organized under the broad categories of process and organizational support.

Assets are continually being added to the PAL. The PAL is for the Information Systems Division (ISD), and is augmented to serve all GSFC software projects.

PAL assets may be accessed in multiple ways. Views, routes, or "views", can help you find the assets you need.

PAL Contents:

- + All Approved Assets
- + Index of Assets
- Asset Categories:
 - + Project Management
 - + Product Development
 - + Organizational Support
 - + Assurance
- Assets by Role
- Assets by Tailoring
- Assets by Type

View

All Approved

Index

Project

Config. Management

Measurement and Analysis

Process Engineering

Software Assurance

Training

Organizational Support - Microsoft Internet Explorer

Address: <http://software.gsfc.nasa.gov/OrgSupp.cfm?Process=Configuration%20Management>

Category: Organizational Support

Process: Configuration Management

Organizational Support is...

Processes that are used throughout the life cycle in support of project management, product development, and/or acquisition. Organizational support consists of cross-cutting project activities such as configuration management and software assurance, and organization-level activities such as training and process improvement. (Adapted from "Capability Maturity Model Integration [CMMI]", Version 1.1)

Configuration Management is...

Maintaining the integrity of the system as it is under development; includes requirements control, change control, and version control

The table below shows all Organizational Support assets pertaining to Configuration Management that are currently listed in the PAL. The asset "owner" is the GSFC branch or organization responsible for developing and/or maintaining the asset. The status column shows the present state of the asset's development.

Asset Number	Title [Links to feedback on this item.]	Owner	Asset Type	Status (More Info)	MS Office	PDF
3.1	ISD Software Configuration Management	580	Process	CCB approved		
3.1.1.1	Configuration Management Plan Template	580	Template	Not started		
3.1.1.1.1	FSW Configuration Management Plan Template	582	Template	CCB approved		
3.1.1.2	ISD Guidance on Data Management and Process Configuration Management	580	Guideline	CCB approved		
3.1.1.2.1	FSB Configuration Management Procedures Template	582	Template	In progress		
3.1.1.2.2	FSW Configuration Management Recommended Practice	582	Guideline	In progress		

Feedback and Help

- **Provide feedback on assets or the PAL:**
 - Go to <http://software.gsfc.nasa.gov/index.cfm>
 - Highlight process name and click for a *Feedback Form*

- **Get help when you need it:**
 - Sally Godfrey – Software Process Improvement Manager
 - Sara.H.Godfrey@nasa.gov
 - Sanjeev Sharma – Software Process Improvement Deputy
 - Sanjeev.K.Sharma@nasa.gov

Summary

- **Configuration Management establishes and maintains the integrity of software project products throughout the software life cycle**
- **The CM planning, startup, and execution tasks support:**
 - Establish CM infrastructure
 - Configuration Identification
 - Configuration Control
 - Configuration Status Accounting
 - Configuration Audits
- **The ISD CM approach can be tailored**
- **CM process and product records must be organized and maintained**
- **CM support information can be found at**
[*http://software.gsfc.nasa.gov*](http://software.gsfc.nasa.gov)
 - ISD Software Configuration Management Process – Asset 3.1
 - Flight Software CM Plan template – Asset 3.1.1.1.1

Questions?